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Assessing Potential Effects of Incinerating Hazardous Wastes at Sea Using Research to Answer Management Questions

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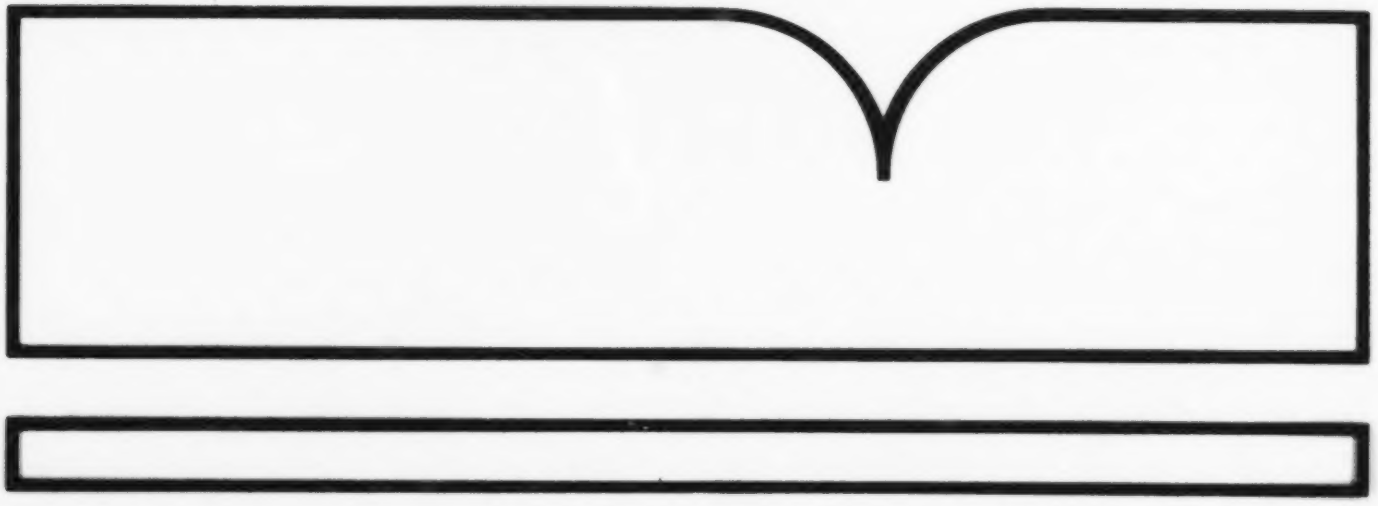

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16. ABSTRACT The paper discusses using research to answer management questions relating to the assessment of potential effects of incinerating hazardous wastes at sea. In 1985, the U.S. EPA developed a strategy to address the research necessary to measure environmental and public health effects of incinerating hazardous wastes at sea. Although existing data indicated that effects would be minimal, the research strategy was designed to ensure that effects would be adequately and accurately assessed. These methods have been developed and evaluated in land-based tests: they have been found suitable for use in research to be conducted at sea. Plans for conducting research at sea will include emissions sampling and toxicity tests in conjunction with monitoring for emissions constituents in the air, surface water, sea-surface microlayer, and organisms that live in surface waters (neuston). Samples from the sea-surface microlayer will also be used as test media for toxicity tests. Results of the research conducted at sea may be used to refine the procedures to be used in permitting and monitoring ocean incineration activities. The paper describes development of EPA's ocean incineration regulation and a program to administer the regulation and EPA's research strategy. Also discussed is the use of these results in developing short- and long-term monitoring programs.

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ASSESSING POTENTIAL EFFECTS OF INCINERATING HAZARDOUS WASTES AT SEA: USING RESEARCH TO ANSWER MANAGEMENT QUESTIONS

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ABSTRACT

In 1985, the U.S. Environmental Protection Agency (EPA) developed a strategy to address the research necessary for measuring possible environmental and public health effects of incinerating hazardous wastes at sea. Although existing data indicated that effects would be minimal, the research strategy was designed to ensure that possible effects would be adequately and accurately assessed.

These methods have been developed and evaluated in a series of land-based tests, and they have been found suitable for use in research to be conducted at sea. Plans for conducting research at sea will include emissions sampling and conduct of toxicity tests in conjunction with monitoring for emissions constituents in the air, surface water, sea-surface microlayer, and organisms that live in surface waters (neuston). Samples from the sea-surface microlayer will also be used as test media for toxicity tests. Results of the research conducted at sea may be used to refine the procedures to be used in permitting and monitoring ocean incineration activities.

This paper describes development of EPA's ocean incineration regulation and an operating program to administer the regulation as well as EPA's research strategy. We also discuss the use of these results in the determining conditions for ocean incineration permits and in developing short- and long-term monitoring programs.

BACKGROUND

With the passage of the Resource Conservation and Recovery Act (RCRA) in 1972, and recent amendments in 1974 and 1980, the U.S. Environmental Protection Agency (EPA) has more actively encouraged reduction and recycling of wastes. EPA has also explored alternatives to land-based waste disposal options. One of these options is destruction of wastes through high temperature incineration at sea. EPA, under the authority of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), is the United States agency charged with regulating the disposal of waste materials in the ocean. The destruction of wastes through ocean incineration is one of the disposal activities regulated under the MPRSA.

The technology for incinerating hazardous wastes at sea was developed in Europe nearly 20 years ago. In the United States, ocean incineration is not currently a commercially available option for disposal of hazardous wastes. EPA has, however, been evaluating this technology for 13 years. Within EPA's Office of Water, the Office of Marine and Estuarine Protection is responsible for regulating ocean incineration.

Although the MPRSA gives EPA the authority to regulate ocean incineration, the actual procedures, guidelines, and requirements for regulating ocean incineration were initially in the Ocean Dumping Regulations (40 CFR Part 228). Between 1974 and 1982, research permits for

incineration were granted by EPA under the Ocean Dumping Regulations for a series of four burns. The objectives of these burns included testing the efficiencies of the incinerators for destroying the hazardous materials and to evaluate the operating conditions of the incinerator vessels.

Three of the four series of burns of organochlorine wastes, including PCBs for one burn, were carried out in the Gulf of Mexico aboard the M/T Vulcanus I in 1974-45, 1977, and 1981-82. The fourth, also conducted aboard the M/T Vulcanus I, was conducted in 1977 in the South Pacific Ocean, near the Johnston Atoll. The herbicide Agent Orange was burned at that time. In addition, EPA monitored a European burn of organochlorine wastes on the M/T Vulcanus II in 1983.

Following the 1982 burn of PCB waste in the Gulf of Mexico and the 1983 burn of organochlorine wastes in the North Sea, EPA received an application from Chemical Waste Management, Inc. (CWM) for special (permits to operate commercially) and research permits. CWM proposed to burn PCB and DDT wastes. Upon evaluation of public comment on the proposed permit, EPA denied the permits to CWM in 1984.

In denying the permits, the EPA Assistant Administrator of Water directed EPA to initiate development of specific ocean incineration regulations and to design a comprehensive research plan for more accurately and completely examining

the potential environmental and public health risks of incinerating hazardous wastes at sea. The new regulations would be more relevant to the incineration process than were the Ocean Dumping Regulations. Although existing information had indicated that effects would be minimal, the research plan would describe how work conducted to date and new information would be used to develop a greater understanding of the ocean incineration process.

OCEAN INCINERATION REGULATION

In February 1985, EPA issued a Proposed Ocean Incineration Regulation (50 FR 8222). Site designation and management procedures in this rule were modeled after those in the Ocean Dumping Regulations and the London Dumping Convention (LDC). Incinerator performance requirements and hazardous waste handling provisions were adapted from RCRA and the Toxic Substances Control Act. Major provisions of the regulation included the requirement to demonstrate need for ocean incineration, procedures for site selection and designation, procedures for permitting, and specification for incinerator operations and site monitoring. The proposed regulation also included information on incinerator performance, waste specifications and limitations, and procedures for calculating allowable concentrations of metals in the waste.

During the public comment period in 1985, EPA received many comments on various aspects of the regulation. To ensure that concerns of the public are fully addressed in the Final Ocean Incineration Regulation, EPA will reopen the public comment period on some major issues. Therefore, in late 1987, the comment period will be reopened on the following issues: determination of need for ocean incineration; financial responsibility of the applicant; concentration limits for trace metals in the waste mixture; implementation of environmental performance standards; protocols for waste sampling and analysis; port siting; permit applicant integrity; and permit application fees.

DEVELOPMENT OF AN OCEAN INCINERATION OPERATING PROGRAM

To manage the program that will result from the Final Ocean Incineration Regulation, EPA is developing an operating program that encompasses the site designation process, ocean incineration permitting, and management of sites and permits.

EPA's site designation program currently involves preparation of specific guidance that will serve as a companion to the regulation. The guidance will include a description of procedures for selecting sites and preparing an Environmental Impact Statement (or a supplement to an existing one).

The site designation process has also included evaluation of currently designated or proposed incineration sites. Since 1983, EPA has conducted several baseline surveys to existing or proposed sites as well as to areas that may in the future be appropriate for ocean incineration sites. Data collection during these surveys has included evaluation of air and water for background levels of organic compounds of the type that may be incinerated or may result from the incineration process; characterization of the neuston (surface water) community; and quantification of seabirds and endangered species of whales and turtles.

The permitting process provided in the Ocean Incineration Regulation will be protective of the environment and will provide for public comment and participation. EPA is preparing guidance on the overall permitting process and on several specific issues, such as the preparation of contingency plans and for conducting trial burns. Contingency plans, which will be required as part of the permit application, must detail the procedures that applicants will take to avoid accidents and those that will be taken in the event of accident or unplanned occurrence. Trial burns, which will be performed prior to granting an operating permit, are designed for the applicant to demonstrate that the incinerators are capable of operating at the conditions and achieving the destruction efficiency specified by the regulation.

In designating sites and issuing permits, EPA believes

that criteria developed for both site designation and for permitting will adequately protect the marine environment. EPA's monitoring programs are designed to test this assumption. EPA is currently developing monitoring programs for ocean incineration that will include assessment of compliance with permit conditions and assessment of potential environmental impacts from incineration of wastes.

EPA'S OCEAN INCINERATION RESEARCH STRATEGY

EPA's comprehensive strategy to obtain information necessary for effective management of ocean incineration activities was drafted in 1984-85 (EPA, 1985). The major focus of the research strategy was the development of a rational, scientifically defensible methodology for an updated assessment of environmental risks associated with ocean incineration. There is a significant difference between assessing risk associated with effects of a specific hazardous compound and that associated with a complex mixture, such as the incinerator emissions of a hazardous waste incinerator. Incinerator emissions are difficult to sample at high temperatures, may exist in two phases (emissions gases and scrubber water), and are not easily characterized.

The research strategy developed by EPA is divided into three major areas, each having specific objectives. The

research in Study Area 1 involves development of methods for sampling incinerator emissions for chemical characterization and toxicity testing. Testing the toxicity of the emissions to aquatic organisms has involved developing a system to sample a known volume of emissions from an incinerator stack and incorporating them into seawater. The emissions-in-seawater mixture can then be used as a test medium in toxicity tests that are conducted at sea.

Study Area 2 of the research strategy involves determining the potential environmental impacts of incinerator emissions on all components of the environment and includes the use of the methods developed under Study Area 1 as well as other sampling and analysis methodology in the field. Study Area 2 is expected to culminate in the conduct of a research burn or burns at sea. Monitoring of the burn will include emissions sampling and conduct of toxicity tests in conjunction with monitoring for emissions constituents in the air, surface water, sea-surface microlayer, and neuston. Samples from the sea-surface microlayer will also be used as test media for toxicity tests.

Under Study Area 3, detailed studies are being conducted to evaluate the impacts of ocean incineration on public health and welfare. This research area includes detailed studies of transport and fate of emissions in the air and water column, toxicity tests using organisms indigenous to potential burn sites, studies of the air-sea

interface, and long-range studies to evaluate the effects of bioaccumulation of emissions constituents.

EPA has been implementing the ocean incineration research strategy since it was adopted in 1985. The results of the research being conducted in Study Areas 1, 2, and 3 will be used in developing, refining, or implementing the ocean incineration operating program. Specifically, results of the research will be used to refine permit conditions for incinerator operations and performance monitoring and to refine the monitoring programs currently under development. Results of the research will be made available to the public when final reports have been prepared and reviewed by the scientific community.

REFERENCES

U.S. Environmental Protection Agency (1985) Incineration-at-sea research strategy. Washington, DC.